REMARKS

Applicant amends the specification and claims to address the Examiner's objections and to correct informalities of language in the claims.

IN THE SPECIFICATION

The paragraphs of the Summary of the Invention beginning on page 4, line 14, page 5, line 1 and page 5 line 21 have been replaced to conform to the claims as amended.

The paragraph beginning on page 19, line 10 has been amended in line 19 to recite -- input ports 223-- rather than "input ports 223A". This amendment conforms to the specification on page 19, line 21 and page 21, line 18 which recite "input ports 223" and Figure 5 which contains reference number 223.

The paragraph beginning on page 21, line 18 has been amended on page 22, line 5 to recite --real time VPCs 222A-- rather than "real time VPCs 224A". This amendment conforms to the specification on page 19, lines 18 and 25, page 20, line 5 and page 22, line 7 which recite "real time VPCs 222A".

IN THE CLAIMS

Claim 1

Claim 1 has been amended in line 2 to recite --core source-- rather than "source" and to recite --core destination-- rather than "destination". This amendment has been made to correct informalities of language in Claim 1.

Claim 1 has been amended in lines 3, 4, 6 and 12 to recite --core source-- rather than "source" to provide proper antecedent basis. Claim 1 has been amended in lines 3, 9 and 12 to recite --core destination-- rather than "destination" to provide proper antecedent basis.

Claim 1 has been amended in line 4 to recite --the path having one of a plurality of class of transmission service--. This amendment conforms to the specification on pages 3-4 which discuss a Virtual Path Connection (VPC) being associated with a level of service to provide that level of service to its Virtual Channel Connections (VCCs).

Claim 1 has been amended in line 4 to recite --each of the plurality of connections having-- rather than "each of the connections being associated with". This amendment has been made to correct informalities of language in Claim 1.

Claim 1 has been amended in line 5 to recite --such that at least two of the plurality of connections do not respectively have a same class of transmission service--. This amendment conforms to the specification on page 7, lines 22-23 which states that "[c]omponent VCCs are aggregated onto a VPC at the aggregation point" and on page 14, lines 20-26 which states that "[t]he incoming VCCs 112, 114, 116 may be ABR VCCs or may have other non-real time service categories such as nrt-VBR and UBR". Further on page 14, lines 20-26, the embodiment discloses "aggregating non-real time VCCs of different service categories onto a common ABR VPC".

Claim 1 has been amended in line 6 to recite --said plurality of connections-- rather than "said connections" to provide proper antecedent basis.

Claim 1 has been amended in lines 7-8 to recite --without regard to which of the plurality of connections the non-real time traffic is associated-- rather than "without regard to the

connections with which the non-real time traffic is associated". This amendment has been made to correct informalities of language in Claim 1.

Claim 1 has been amended in line 8 to recite --and without regard to the class of transmission service of such plurality of connections--. This amendment conforms to the specification on page 8, lines 20-22 which states that "the non-real time traffic is transmitted over the VPCs within the core network 2 without regard to the ... associated class of transmission service with which the component non-real time traffic is originally associated prior to aggregation".

Claim 1 has been amended in line 10 to recite --which of the plurality of connections the non-real time traffic is associated-- rather than "the corresponding connections with which the non-real time traffic is associated". This amendment has been made to provide proper antecedent basis for the terms of Claim 1.

Claim 1 has been amended in line 13 to recite -- wherein the path is provisioned with a guaranteed transmission bandwidth--. This amendment conforms to the specification on page 9, lines 1-14 which discusses the "guaranteed bandwidth corresponding to a [non-real time] path".

The Examiner had objected to Claim 1 under 35 U.S.C. 103(a) as being unpatentable over Ma (US 5,953,338) in view of Siu (US 6,252,851). The Examiner had contended that Ma discloses a communication network having a network core, wherein the traffic entering the network core is aggregated from a plurality of connections onto paths, the connections from which the traffic is received being associated with one of a plurality of classes of transmission service. The Examiner further contended that Siu discloses a TCP acknowledgement based flow control mechanism. The Examiner had concluded that it would have been obvious to a person skilled in the art to somehow implement the TCP acknowledgement based flow control disclosed

in Siu to the non-real time path of the ATM network in Ma for adjusting the transmission rate of traffic such as IP traffic, thereby conceivably providing the subject matter recited in Claim 1.

Applicant respectfully traverses the Examiner's objections to Claim 1 in view of the various amendments being proposed thereto. Ma does not disclose or suggest provisioning a non-real time path having the recited characteristics of amended Claim 1 with a "guaranteed transmission bandwidth" as now introduced in amended Claim 1 by way of the present amendment. Instead, Ma teaches away from providing an aggregated non-real time path with a guaranteed bandwidth. In column 11, lines 63-66, Ma specifically discloses that a path aggregating non-real time connections onto a virtual path will be provisioned for "unspecified" quality of service, and that such a virtual path will be deployed by a service provider to offer an "unguaranteed" or a "best-effort" service. This is contrary to the recited feature of amended Claim 1, wherein the aggregated non-real time path provides a guaranteed transmission bandwidth.

For connections that do not aggregate onto an "unspecified" quality of service path, Ma states in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specific traffic type as indicated by its quality of service requirements". Two or more connections of different classes of transmission service will be understood by those skilled in this art as having different "quality of service requirements". In contrast, amended Claim 1 now explicitly recites that the non-real time traffic is "received at the core source from a plurality of connections ... such that at least two of the plurality of connections do not respectively have a same class of transmission service". According to the teachings of Ma, however, such traffic having different quality of service requirements will be segregated onto correspondingly different paths rather than being aggregated onto the same path as taught in Claim 1. Moreover, Claim 1 as now

amended recites that the transmission of aggregated non-real time traffic is made without regard to the class of transmission service of the aggregated connections. Again, Ma clearly teaches the contrary, namely that the class of transmission service of a connection will dictate that of the path onto which aggregation of the like connections takes place.

Also, Siu does not teach applying TCP acknowledgement based flow control specifically across a network core. Flow control as now recited in amended Claim 1 is from a "core source" to a "core destination", and namely at edge notes of the network core. Siu instead teaches a combination of using ABR flow control with TCP flow control. The method of flow control described in Siu does not terminate at the edge of the ATM network but "is effectively extended all the way to the TCP source" [column 4, lines 7-8]. Therefore, combining Ma with Siu does not provide the invention as recited in Claim 1.

Additionally, it is respectfully submitted that the Examiner has provided no objective evidence of any teaching, motivation or suggestion for combining Ma and Siu. The Examiner is required to provide such evidence. *In re Lee*, 61 USPQ2d 1430 (CA FC 2002) states on pages 1433-4 that "[w]hen patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references relied on as evidence of obviousness". The rationale for combining references "must be based on objective evidence of record" and cannot be "resolved on subjective belief and unknown authority".

Further, the *Manual of Patent Examining Procedure* ("*MPEP*") sets out that the motivation to combine references must be explicitly set out. Section 2142 provides that:

> If the examiner does not produce a prima facie case [of obviousness], the applicant is under no obligation to submit evidence of nonobviousness. ... To establish a prima facie case of

> obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The *teaching or suggestion to make the claimed combination* and the reasonable expectation of success *must both be found in the prior art*, and not based on applicant's disclosure. (emphasis added)

Additionally, section 2141 of *MPEP* requires that "[w]hen applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: ... The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination". The Examiner must therefore produce "objective evidence of record" from the prior art showing motivation to combine these references and the reasonable expectation of success from such combination. The Examiner has not provided any motivation or suggestion as to why Ma and Siu should be combined. However, even if this were the case, it has been submitted above that Ma and Siu do not in any way teach or suggest the teachings of the invention as now recited in amended Claim 1.

Applicant respectfully submits that the Examiner's objections to Claim 1 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. None of the references of record teach or suggest the combination of features recited in Claim 1 as amended.

Claim 2

Claim 2 has been amended to recite --the plurality of connections-- rather than "the connections" to provide proper antecedent basis.

Claim 2 has been amended to recite --the non-real time traffic is ATM traffic--. This amendment conforms to the specification on page 2, line 23 which states that an ATM network carries "ATM cell traffic".

Claim 2 has been amended to recite --the plurality of classes of transmission service are ATM service categories--. This amendment conforms to the specification on pages 2 and 8 which define the embodiment of the invention as dealing with classes of transmission service that correspond to ATM service categories.

The Examiner had objected to Claim 2 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu. The Examiner had contended in objection to Claim 1 that VPCs 605 and 606 disclosed in Ma could be used to transmit non-real time traffic. The Examiner had also contended that Ma discloses Virtual Channel Connections (VCCs) and Virtual Path Connections (VPCs) in an ATM network, thereby conceivably providing the subject matter recited in Claim 2.

Applicant respectfully traverses the Examiner's objections to Claim 2 in view of the various amendments being proposed thereto. Claim 2 as amended now recites that non-real time traffic aggregated onto the path is ATM traffic. However, Ma teaches away from ATM traffic being aggregated onto connection-oriented path 605 or connectionless path 606. In column 12, lines 2-7, Ma specifically describes that virtual path 605 is assigned for "Connection-Oriented traffic (for frame-Relay)" and that virtual path 606 is assigned for "Connectionless traffic (for IP traffic)". There is no mention of ATM traffic in wither of these cases.

Additionally, Claim 2 as amended now recites that the plurality of classes of transmission service are ATM service categories. Combined with the limitations of Claim 1 as amended, Claim 2 as amended provides that the aggregated non-real time path is associated with an ATM service category. However, as mentioned previously in column 12 at lines 2-7 Ma describes

VPC 605 as a connection-oriented path and VPC 606 as a connectionless path. Ma does not teach either VPC 605 or 606 being associated with an ATM service category as recited in Claim 2.

Further, Claim 2 now explicitly recites that the classes of transmission service are ATM service categories. Ma states in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specific traffic type as indicated by its quality of service requirements". Although Ma does not make mention of non-real time ATM connections, two non-real time connections having different ATM service categories will be understood by those skilled in this art as having different quality of service requirements. Therefore, Ma would be understood by the notional skilled person as teaching that two non-real time connections having different ATM service categories are to be provided separate paths. The teachings of Ma are contrary to Claim 2 as amended. Combined with the features of Claim 1; Claim 2 provides that two non-real time connections having different ATM service categories will be aggregated onto a non-real time path, not separate paths as taught by Ma. Therefore, combining Ma with Siu does not provide the invention as recited in Claim 2.

As set out previously, the Examiner also has provided no objective evidence of motivation to combine Ma and Siu. However, even if this were the case, it has been submitted above that Ma and Siu do not in any way teach or suggest the teachings of the invention as now recited in amended Claim 2.

It is therefore respectfully submitted that the Examiner's objections to Claim 2 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claim 2 is dependent from Claim 1 and the objections to Claim 1 have now been overcome, it is

respectfully submitted that the Examiner's objections to Claim 2 under 35 U.S.C. 103(a) are now overcome.

Claims 3 and 4

Claim 3 has been amended in lines 1 and 3 to recite --core source-- rather than "source" to provide proper antecedent basis. Claim 3 has been amended in line 2 to recite --core destination-- rather than "destination" to provide proper antecedent basis.

Claim 4 has been amended in lines 1 and 3 to recite --core source-- rather than "source" to provide proper antecedent basis. Claim 4 has been amended in line 2 to recite --core destination-- rather than "destination" to provide proper antecedent basis.

The Examiner had objected to Claims 3 and 4 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu. It is respectfully submitted that the Examiner's objections to Claims 3 and 4 under 35 U.S.C. 103(a) are now overcome since these are dependent from Claim 2 and the objections to Claim 2 have now been overcome.

Claim 5

The Examiner had objected to Claim 5 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu. The Examiner had contended that Ma discloses non-real time virtual paths 605 and 606 provisioned for Connection-Oriented traffic (for frame relay) and Connectionless traffic (for IP traffic). The Examiner had also contended that Siu discloses ABR service provided in an ATM network connected to Ethernet. The Examiner had therefore concluded that it would have been obvious to a person skilled in the art to somehow implement

the ABR service disclosed in Siu onto the paths disclosed in Ma, thereby conceivably producing the subject matter recited in Claim 5.

Applicant respectfully traverses the Examiner's objections to Claim 5 in view of the various amendments being proposed. The Examiner had contended that a path 605 or 606 in Ma could be an ABR path onto which non-real time traffic is aggregated. However, Ma discloses in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specified traffic type as indicated by its quality of service requirements". Ma does not mention ABR connections. However, if ABR connections according to the teachings of Ma were to be aggregated onto an ABR path, non-ABR connections would use another path as it would be understood to those skilled in this art upon reading Ma that ABR connections and non-ABR connections have different quality of service requirements. However, Claim 5 specifically recites aggregation of non-real time connections having different ATM service categories on an ABR path, i.e. at least one connection aggregated onto the ABR path will be a non-ABR connection. Therefore, combining Ma with Siu does not provide the invention as recited in Claim 5.

As set out previously, the Examiner also has provided no objective evidence of motivation to combine Ma and Siu. However, even if this were the case, it has been submitted above that Ma and Siu do not in any way teach or suggest the teachings of the invention as now recited in Claim 5.

It is therefore respectfully submitted that the Examiner's objections to Claim 5 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claim 5 is dependent from Claim 1 and the objections to Claim 1 have now been overcome, it is respectfully submitted that the Examiner's objections to Claim 5 under 35 U.S.C. 103(a) are now overcome.

Claims 6 and 7

Claim 6 has been amended in lines 1 and 2 to recite --at least one of the plurality of connections aggregated onto the path is provisioned with a guaranteed bandwidth-- rather than "each of the connections is provisioned with a guaranteed bandwidth". This amendment conforms to the specification at page 8, lines 22-25 which states that "[s]ervice guarantees [for connections in a path] are preferably enforced at the aggregation points such that nodes in the network core do not need to consider the level of service required by the individual non-real time connections being carried on the path".

Claim 6 has been amended in lines 3-4 to recite --the guaranteed transmission bandwidth of the path is obtained by summing the guaranteed transmission bandwidths for the at least one of the plurality of connections aggregated onto the path-- rather than "the non-real time traffic on the path is provisioned with a guaranteed bandwidth" to provide proper antecedent basis.

Claim 7 has been amended in lines 1-2 to recite --the guaranteed transmission bandwidth for the at least one of the plurality of connections is a guaranteed minimum transmission bandwidth and the guaranteed transmission bandwidth for the path is a guaranteed minimum transmission bandwidth-- rather than "the guaranteed bandwidths corresponding to the connections and the path are guaranteed minimum bandwidths" to provide proper antecedent basis and to correct informalities of language in Claim 7.

The Examiner had objected to Claims 6 and 7 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and in further view of Varma (US 5,959,993). Varma provides a cell scheduler that schedules transmission of cells from the switch. Cells in Varma are stored in groups of per-VC queues prior to transmission. The Examiner had contended that

Varma discloses that each connection and the non-real time traffic on the path are provisioned with a guaranteed minimum bandwidth. The Examiner had concluded that it would have been obvious to a person skilled in the art to somehow implement the teaching of Varma to provide guaranteed bandwidth to the system disclosed in Ma, thereby conceivably providing the subject matter recited in Claims 6 and 7. The Examiner had contended that the motivation for such combination of Varma and Ma was to provide the benefit disclosed in Varma.

Applicant respectfully traverses the Examiner's objections to Claims 6 and 7 in view of the various amendments being proposed. In Column 7, lines 20-34, Varma discloses provisioning a number of virtual connections (VCs) with a guaranteed transmission bandwidth, but does not disclose provisioning a path with a guaranteed transmission bandwidth. It is respectfully submitted that Claims 6 and 7 specifically recite that the path (VP) and at least one of the connections (VCs) are provisioned with a guaranteed transmission bandwidth. Therefore, combining Varma with Ma and Siu does not provide the invention as recited in Claims 6 or 7.

The Examiner also has provided no objective evidence of motivation to combine Ma and Siu with Varma. However, even if this were the case, it has been submitted above that Ma and Siu do not in any way teach or suggest the teachings of the invention as recited in Claims 6 and 7.

It is therefore respectfully submitted that the Examiner's objections to Claims 6 and 7 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claims 6 and 7 are successively dependent from Claim 1 and the objections to Claim 1 have now been overcome, it is respectfully submitted that the Examiner's objections to Claims 6 and 7 under 35 U.S.C. 103(a) are now overcome.

Claims 8 and 9

Claim 8 has been amended in line 1 to recite --network core-- rather than "core network" and in line 3 to recite --guaranteed minimum transmission bandwidth-- rather than "guaranteed bandwidth" to provide proper antecedent basis.

Claim 9 has been amended in line 1 to recite --a share of the transmission bandwidth-- rather than "transmission bandwidth". Claim 9 has been amended in lines 1-2 to recite -- guaranteed minimum transmission bandwidth for one of the plurality of connections-- rather than "guaranteed minimum bandwidth". Claim 9 has been amended in line 2 to recite --the one of the plurality of connections-- rather than "a corresponding connection". Claim 9 has been amended in lines 2-3 to recite --the transmission bandwidth allocated to another of the plurality of connections is unused-- rather than "the guaranteed minimum bandwidth that is allocated to another connection is unused". These amendments have been made to correct informalities of language in Claim 9.

The Examiner had objected to Claims 8 and 9 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Charny (US 5,745,697). Charny discloses a method and apparatus for providing flow control between a source and a destination that reduces computational complexity. The Examiner had contended that Charny also discloses providing bandwidth unused by a real time path to a non-real time path. However, the Examiner has provided no objective evidence of motivation for combining Ma, Siu and Varma with Charny. However, even if this were the case, it is respectfully submitted that since Claims 8 and 9 are dependent from Claim 7 and the objections to Claim 7 have now been overcome, it is respectfully submitted that the Examiner's objections to Claims 8 and 9 under 35 U.S.C. 103(a) are now overcome.

Claim 10

Claim 10 has been amended in lines 1, 2 and 3 to recite --core source-- rather than "source" to provide proper antecedent basis. Claim 10 has been amended in lines 1, 2, and 3 to recite --core destination-- rather than "destination" to provide proper antecedent basis.

The Examiner had objected to Claim 10 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu. It is respectfully submitted that the Examiner's objections to Claim 10 under 35 U.S.C. 103(a) are now overcome since it is dependent from Claim 5 and the objections to Claim 5 have now been overcome.

Claim 11

Claim 11 has been amended in line 1 to recite --core source-- rather than "source" to provide proper antecedent basis.

The Examiner had objected to Claim 11 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac (US 5,557,608). The Examiner had contended that Calvignac discloses using "a set of queues (high priority queue 42 and low priority queue 43, see figure 13) at the source". Calvignac discloses a method of interrupting low priority traffic to transmit high priority traffic on a communication link. The Examiner had concluded that it would have been obvious to a person skilled in the art to somehow implement a set of queues for each class of transmission service as taught by Calvignac at the source ports of the ATM network disclosed in Ma, thereby conceivably providing the subject matter recited in Claim 11.

Applicant respectfully traverses the Examiner's objections to Claim 11 in view of the various amendments being proposed. Calvignac discloses in Figure 1 using a single non-real time queue for non-real time traffic. In contrast, Claim 11 recites using a separate queue for each class of transmission service of the non-real time traffic. Therefore, combining Calvignac with Ma, Siu and Varma does not provide the invention as recited in Claim 11.

The Examiner also has provided no objective evidence of motivation to combine Ma, Siu and Varma with Calvignac. However, even if this were the case, it has been submitted above that Ma, Siu Varma and Calvignac do not in any way teach or suggest the teachings of the invention as now recited in Claim 11.

It is therefore respectfully submitted that the Examiner's objections to Claim 11 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claim 11 is dependent from Claim 10 and the objections to Claim 10 have now been overcome, it is respectfully submitted that the Examiner's objections to Claim 11 under 35 U.S.C. 103(a) are now overcome.

Claim 12

Claim 12 has been amended in line 1 to recite --core source-- rather than "source" to provide proper antecedent basis.

Claim 12 has been amended in lines 1-2 and 2-3 to recite --said each of the plurality of connections-- rather than "each connection" to provide proper antecedent basis.

The Examiner had objected to Claim 12 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. It is respectfully submitted

that the Examiner's objections to Claim 12 under 35 U.S.C. 103(a) are now overcome since it is dependent from Claim 10 and the objections to Claim 10 have now been overcome.

Claims 13 and 14

Claim 13 has been amended in line 2 to recite --core source-- rather than "source" to provide proper antecedent basis.

Claim 14 has been amended in lines 1-2 to recite --the plurality of connections-- rather than "the connections" to provide antecedent basis.

The Examiner had objected to Claim 14 under 37 C.F.R. 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. The Examiner made this objection contending that Claim 14 describes the "traffic management..." (lines 1-2) recited Claim 11 but Claim 11 does not recite any "traffic management". It is respectfully submitted that Claim 14 describes the "traffic management..." (lines 1-2) recited in Claim 13, not Claim 11 as contended by the Examiner. It is therefore respectfully submitted that this overcomes the Examiner's objection to Claim 14 based on 37 C.F.R. 1.75(c).

The Examiner had also objected to Claim 14 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner contended that it was not seen how the traffic management applied to the non-real time traffic at the source could schedule real-time connections onto the path. It is respectfully submitted that Claim 14, which is ultimately dependent on Claim 1, describes a "method for transmitting non-real time traffic". Therefore, the traffic management described does not schedule real-time connections onto the path. Instead,

Claim 14 recites scheduling non-real time traffic onto the path. It is therefore respectfully submitted that this overcomes the Examiner's objection to Claim 14 based on 35 U.S.C. 112.

The Examiner had objected to Claims 13 and 14 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. It is respectfully submitted that the Examiner's objections to Claims 13 and 14 under 35 U.S.C. 103(a) are now overcome since they are successively dependent from Claim 11 and the objections to Claim 11 have now been overcome.

Claim 15

Claim 15 has been amended in line 6 to recite --each of the non-real time paths having one of a plurality of classes of transmission service, each of the plurality of connections carrying non-real time traffic having one of the plurality of classes of transmission service such that at least two of the plurality of connections aggregated onto a non-real time path do not respectively have a same class of transmission service--. This amendment conforms to the specification on pages 3-4 which discuss a Virtual Path Connection (VPC) being associated with a level of service to provide that level of service to its Virtual Channel Connections (VCCs). This amendment also conforms to the specification on page 7, lines 22-23 which states that "[c]omponent VCCs are aggregated onto a VPC at the aggregation point" and on page 14, lines 20-26 which states that "[t]he incoming VCCs 112, 114, 116 may be ABR VCCs or may have other non-real time service categories such as nrt-VBR and UBR". Further on page 14, lines 20-26, the embodiment discloses "aggregating non-real time VCCs of different service categories onto a common ABR VPC".

Claim 15 has been amended in line 6 to recite --each of the non-real time paths is provisioned with a guaranteed transmission bandwidth--. This amendment conforms to the specification on page 9, lines 1-14 which discusses the "guaranteed bandwidth corresponding to a [non-real time] path".

Claim 15 has been amended in lines 7-8 to recite --core source-- rather than "source" and to recite --core destination-- rather than "destination". This amendment has been made to correct informalities of language in Claim 15.

The Examiner had objected to Claim 15 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and in further view of Varma. In addition to the Examiner's application of Ma and Siu as applied to Claims 25 and 1-5, the Examiner had contended that Varma discloses that "each per-VC queue is used for each service class such as CBR (real-time traffic) and ABR (non-real time traffic)". Varma discloses queuing and scheduling packets that are received on a number of virtual connections (VCs) at a switch. The Examiner had concluded that it would have been obvious to a person skilled in the art to somehow implement per-VC queues for storing real-time and non-real time traffic and a scheduler for outputting traffic from the queues in the ATM network disclosed in Ma, thereby conceivably providing the subject matter recited in Claim 15.

Applicant respectfully traverses the Examiner's objections to Claim 15 in view of the various amendments being proposed thereto. The queues disclosed in Varma are per-VC queues i.e. there is one queue per connection. Claim 15 as amended recites using a queue for storing non-real time traffic which may include traffic from several non-real time connections. Therefore, traffic from different connections in Varma will use separate queues and not the non-real time queue recited in Claim 15.

Additionally, Ma does not disclose or suggest provisioning a non-real time path having the recited characteristics of amended Claim 15 with a "guaranteed transmission bandwidth" as now introduced in amended Claim 15 by way of the present amendment. Instead, Ma teaches away from providing an aggregated non-real time path with a guaranteed bandwidth. In column 11, lines 63-66, Ma specifically discloses that a path aggregating non-real time connections onto a virtual path will be provisioned for "unspecified" quality of service, and that such a virtual path will be deployed by a service provider to offer an "unguaranteed" or a "best-effort" service. This is contrary to the recited feature of amended Claim 15, wherein the aggregated non-real time path provides a guaranteed transmission bandwidth.

For connections that do not aggregate onto an "unspecified" quality of service path, Ma states in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specific traffic type as indicated by its quality of service requirements". Two or more connections of different classes of transmission service will be understood by those skilled in this art as having different "quality of service requirements". In contrast, amended Claim 15 now explicitly recites that the non-real time traffic is "received at the core source from a plurality of connections ... such that at least two of the plurality of connections do not respectively have a same class of transmission service". According to the teachings of Ma, however, such traffic having different quality of service requirements will be segregated onto correspondingly different paths rather than being aggregated onto the same path as taught in Claim 15. Moreover, Claim 15 as now amended recites that the transmission of aggregated non-real time traffic is made without regard to the class of transmission service of the aggregated connections. Again, Ma clearly teaches the contrary, namely that the class of transmission service of a connection will dictate that of the path onto which aggregation of the like connections takes place.

Also, Siu does not teach applying TCP acknowledgement based flow control specifically across a network core. Flow control as now recited in amended Claim 15 is from a "core source" to a "core destination", and namely at edge notes of the network core. Siu instead teaches a combination of using ABR flow control with TCP flow control. The method of flow control described in Siu does not terminate at the edge of the ATM network but "is effectively extended all the way to the TCP source" [column 4, lines 7-8]. Therefore, combining Ma and Siu with Varma does not provide the invention as recited in Claim 15.

Additionally, the Examiner has provided no objective evidence of motivation for combining Ma and Siu with Varma. However, even if this were the case, it has been submitted above that Ma, Siu and Varma do not in any way teach or suggest the teachings of the invention as now recited in amended Claim 15.

It is therefore respectfully submitted that the Examiner's objections to Claim 15 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. None of the references of record teach or suggest the combination of features recited in Claim 15 as amended.

Claims 16-19

Claim 17 has been amended in line 2 to recite --core sources-- rather than "sources" to provide proper antecedent basis.

The Examiner had objected to Claims 16-19 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and in further view of Varma. It is respectfully submitted that the Examiner's objections to Claims 16 to 19 under 35 U.S.C. 103(a) are now overcome since they are successively dependent from Claim 15 and the objections to Claim 15 have now been overcome.

Claim 20

The Examiner had objected to Claim 20 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. The Examiner had contended that Calvignac discloses that the buffer with the lower priority class is served only if the buffer with the highest priority is empty. In Calvignac, service of low priority packets is interrupted when a high priority packet arrives. Service of low priority packets then resumes after the high priority packet has been served. The Examiner had stated that motivation for combining Ma and Calvignac is to provide the benefit of Calvignac. However, the Examiner has provided no objective evidence of motivation to combine Ma, Siu and Varma with Calvignac. Even if this were the case, it is respectfully submitted that the Examiner's objections to Claim 20 under 35 U.S.C. 103(a) are now overcome since it is dependent from Claim 17 and the objections to Claim 17 have now been overcome.

Claim 21

Claim 21 has been amended in line 3 to recite --each of the plurality of connections from which non-real time traffic on the non-real time paths is aggregated-- rather than "each of the non-real time connections from which traffic on the real time paths is aggregated". This amendment conforms to Claim 15 which states that "the real time traffic and the non-real time traffic [from the plurality of connections] each [are] aggregated onto respective real time paths and non-real time paths". Claim 21 has also been amended in line 4 to recite that each of the plurality of connections being aggregated is a --Virtual Channel Connection (VCC)-- rather than

"VPC". This amendment conforms to the specification on page 7, lines 19 and 20 which states that the "VCCs are aggregated onto the VPCs in the core network".

Claim 21 has been amended to recite --the non-real time traffic is ATM traffic--. This amendment conforms to the specification on page 2, line 23 which states that an ATM network carries "ATM cell traffic".

Claim 21 has been amended to recite that the --plurality of classes of transmission service are ATM service categories--. This amendment conforms to the specification on pages 2 and 8 which define the embodiment of the invention as dealing with classes of transmission service that correspond to ATM service categories.

The Examiner had objected to Claim 21 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner contended that it was not clear what was meant by "each of the non-real time connections from which traffic on the real time paths is aggregated is a non real time VPC". The Examiner also contended that the reference to "which traffic" in line 3 lacked antecedent basis as it was not seen "which traffic" is referred to. It is respectfully submitted that the above amendments overcome the Examiner's objections to Claim 21 based on 35 U.S.C. 112.

The Examiner had objected to Claim 21 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. The Examiner had contended in its arguments to Claim 15 that VPCs 605 and 606 in Ma could be used to transmit non-real time traffic.

Applicant respectfully traverses the Examiner's objections to Claim 21 in view of the various amendments being proposed thereto. Claim 21 now specifically recites that the non-real

time traffic transmitted in the network core is ATM traffic. In contrast, Ma clearly teaches away from ATM traffic using either the connection-oriented path or the connectionless path in the network core. Notably, in column 12, lines 2-7, Ma describes virtual path 605 assigned for transmitting frame relay traffic and virtual path 606 assigned for transmitting IP traffic, not for ATM traffic.

Additionally, Claim 21 now explicitly recites that the classes of transmission service are ATM service categories. Combined with the features of Claim 15, Claim 21 provides that the aggregated non-real time path is associated with an ATM service category. However, Ma does not teach or suggest the disclosed connection-oriented VPC 605 or connectionless VPC 606 being associated with an ATM service category.

Further, Ma states in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specific traffic type as indicated by its quality of service requirements". Although Ma does not make mention of non-real time ATM connections, two non-real time connections having different ATM service categories will be understood by those skilled in this art as having different quality of service requirements. Therefore, Ma would be understood by the notional skilled person as teaching that two non-real time connections having different ATM service categories are to be provided separate paths. This is contrary to Claim 21 as amended. Claim 21 now explicitly recites that the classes of transmission service are ATM service categories. Combined with the features of Claim 15, Claim 21 provides that two non-real time connections having different ATM service categories will be aggregated onto a non-real time path, not separate paths as taught by Ma. Therefore, combining Ma, Siu and Varma with Calvignac does not provide the invention as recited in Claim 21.

As set out previously, the Examiner also has provided no objective evidence of motivation to combine Ma, Siu and Varma with Calvignac. However, even if this were the case, it has been submitted above that Ma, Siu and Varma with Calvignac do not in any way teach or suggest the teachings of the invention as now recited in amended Claim 21.

It is therefore respectfully submitted that the Examiner's objections to Claim 21 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claim 21 is dependent from Claim 17 and the objections to Claim 17 have now been overcome, it is respectfully submitted that the Examiner's objections to Claim 21 under 35 U.S.C. 103(a) are now overcome.

Claim 22

The Examiner had objected to Claim 22 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. The Examiner had contended that Figure 6 in Ma discloses that virtual path 603, the CBR path, is used for traffic belonging to the real time class of transmission service.

Applicant respectfully traverses the Examiner's objections to Claim 22 in view of the various amendments being proposed. Ma discloses in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specified traffic type as indicated by its quality of service requirements". It will be understood by those skilled in this art that CBR traffic and VBR traffic have different quality of service requirements and therefore Ma teaches that they will be provisioned separate paths. Additionally, Figure 6 of Ma shows separate paths 603 and 604 for CBR and VBR traffic respectively. Therefore in Ma, real time connections associated with the VBR service category will use VBR path 604, not CBR path 603. In contrast, Claim 22

specifically recites that real time traffic, which may include real time VBR traffic, is transmitted on a CBR path.

Also, the Examiner had contended that Figure 6 in Ma discloses that virtual paths 605 or 606 could be an ABR path on which non-real time traffic is aggregated. However, Ma discloses in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specified traffic type as indicated by its quality of service requirements". Ma does not mention ABR connections. However, if ABR connections according to the teachins of Ma were to be aggregated onto the ABR path, non-ABR connections would use another path as it will be understood to those skilled in this art upon reading Ma that ABR connections and non-ABR connections have different quality of service requirements. However, Claim 22 specifically recites aggregation of non-real time connections having different ATM service categories on an ABR path. Therefore, combining Ma, Siu and Varma with Calvignac does not provide the invention as recited in Claim 22.

As set out previously, the Examiner also has provided no objective evidence of motivation to combine Ma, Siu and Varma with Calvignac. However, even if this were the case, it has been submitted above that Ma, Siu and Varma with Calvignac do not in any way teach or suggest the teachings of the invention as now recited in Claim 22.

It is therefore respectfully submitted that the Examiner's objections to Claim 22 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. Additionally, since Claim 22 is dependent from Claim 21 and the objections to Claim 21 have now been overcome, it is respectfully submitted that the Examiner's objections to Claim 22 under 35 U.S.C. 103(a) are now overcome.

Claim 23

Claim 23 has been amended in line 2 to recite --corresponding source for the non-real time traffic-- rather than "non-real time VP source" to provide antecedent basis.

The Examiner had objected to Claim 23 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu and Varma and in further view of Calvignac. Since Claim 23 is dependent from Claim 22 and the objections to Claim 22 have now been overcome, it is respectfully submitted that the Examiner's objections to Claim 23 under 35 U.S.C. 103(a) are now overcome.

Claim 24

Claim 24 has been amended in line 5 to recite --real time paths-- rather than "real time connections". This amendment conforms to Claim 24, lines 2-3 which recite that "each real time path is associated with a Peak Cell Rate (PCR)".

The Examiner had objected to Claim 24 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu, Varma and Calvignac and in further view of Charny. The Examiner has provided no objective evidence of motivation to combine Ma, Siu, Varma and Calvignac with Charny. However, even if this were the case, it is respectfully submitted that the Examiner's objections to Claim 23 under 35 U.S.C. 103(a) are now overcome since it is dependent from Claim 24 and the objections to Claim 24 have now been overcome.

Claim 25

Claim 25 has been amended in line 2 to recite --network core-- rather than "core" to provide antecedent basis.

Claim 25 has been amended in lines 6-7 to recite --the non-real time traffic which enters the network core and is aggregated onto a path is received from connections that each have one of a plurality of classes of transmission service such that at least two connections have classes of transmission service different from each other-- rather than "the non-real time traffic which enters the network core being received from connections that are each associated with one of a plurality of classes of transmission service such that at least two connections are associated with different classes of transmission service". Claim 25 has been amended in line 9 to recite --each of the non-real time paths having one of the plurality of classes of transmission service--. These amendments have been made to correct informalities of language in Claim 25. They conform to the specification on page 7, lines 22-23 which states that "[c]omponent VCCs are aggregated onto a VPC at the aggregation point" and on page 14, lines 20-26 which states that "[t]he incoming VCCs 112, 114, 116 may be ABR VCCs or may have other non-real time service categories such as nrt-VBR and UBR". Further on page 14, lines 20-26, the embodiment discloses "aggregating non-real time VCCs of different service categories onto a common ABR VPC".

Claim 25 has been amended in line 9 to recite --each of the non-real time paths is provisioned with a guaranteed transmission bandwidth--. This amendment conforms to the specification on page 9, lines 1-14 which discusses the "guaranteed bandwidth corresponding to a [non-real time] path".

Claim 25 has been amended in lines 10 and 12 to recite --core source-- rather than "source" and to recite --core destination-- rather than "destination". This amendment has been made to correct informalities of language in Claim 25.

Claim 25 has been amended in line 13 to recite --core source-- rather than "source" and to recite --core destination-- rather than "destination" to provide proper antecedent basis.

The Examiner had objected to Claim 25 under 35 U.S.C. 103(a) as being unpatentable over Ma in view of Siu. The Examiner had contended that Ma discloses a communication network having a network core, wherein the traffic entering the network core is aggregated from a plurality of connections onto paths, the connections from which the traffic is received being associated with one of a plurality of classes of transmission service. The Examiner further contended that Siu discloses a TCP acknowledgement based flow control mechanism. The Examiner had concluded that it would have been obvious to a person skilled in the art to somehow implement the TCP acknowledgement based flow control disclosed in Siu to the non-real time path of the ATM network in Ma for adjusting the transmission rate of traffic such as IP traffic, thereby conceivably providing the subject matter recited in Claim 25.

Applicant respectfully traverses the Examiner's objections to Claim 25 in view of the various amendments being proposed thereto. Ma does not disclose or suggest provisioning a non-real time path having the recited characteristics of amended Claim 25 with a "guaranteed transmission bandwidth" as now introduced in amended Claim 25 by way of the present amendment. Instead, Ma teaches away from providing an aggregated non-real time path with a guaranteed bandwidth. In column 11, lines 63-66, Ma specifically discloses that a path aggregating non-real time connections onto a virtual path will be provisioned for "unspecified" quality of service, and that such a virtual path will be deployed by a service provider to offer an "unguaranteed" or a "best-effort" service. This is contrary to the recited feature of amended Claim 25, wherein the aggregated non-real time path provides a guaranteed transmission bandwidth.

For connections that do not aggregate onto an "unspecified" quality of service path, Ma states in column 11, lines 61-63 that "a unique virtual path will be provisioned for each specific traffic type as indicated by its quality of service requirements". Two or more connections of different classes of transmission service will be understood by those skilled in this art as having different "quality of service requirements". In contrast, amended Claim 25 now explicitly recites that the non-real time traffic is "received at the core source from a plurality of connections ... such that at least two of the plurality of connections do not respectively have a same class of transmission service". According to the teachings of Ma, however, such traffic having different quality of service requirements will be segregated onto correspondingly different paths rather than being aggregated onto the same path as taught in Claim 25. Moreover, Claim 25 as now amended recites that the transmission of aggregated non-real time traffic is made without regard to the class of transmission service of the aggregated connections. Again, Ma clearly teaches the contrary, namely that the class of transmission service of a connection will dictate that of the path onto which aggregation of the like connections takes place.

Also, Siu does not teach applying TCP acknowledgement based flow control specifically across a network core. Flow control as now recited in amended Claim 25 is from a "core source" to a "core destination", and namely at edge notes of the network core. Siu instead teaches a combination of using ABR flow control with TCP flow control. The method of flow control described in Siu does not terminate at the edge of the ATM network but "is effectively extended all the way to the TCP source" [column 4, lines 7-8]. Therefore, combining Ma with Siu does not provide the invention as recited in Claim 25.

Additionally, the Examiner has provided no objective evidence of motivation for combining Ma and Siu. However, even if this were the case, it has been submitted above that Ma

and Siu do not in any way teach or suggest the teachings of the invention as now recited in amended Claim 25.

It is therefore respectfully submitted that the Examiner's objections to Claim 25 under 35 U.S.C. 103(a) are now overcome in view of the present amendment. None of the references of record teach or suggest the combination of features recited in Claim 25 as amended.

IN THE DRAWINGS

Figure 5 has been amended to replace the arrow at 233 showing flow control mechanism 232 receiving queue status information from CBR queue 226 with an arrow at 233 showing flow control mechanism 232 receiving queue status information from ABR queue 228. This amendment conforms to the specification at page 21, lines 23-25 which recites "the flow control mechanism 232 ... may receive queue status information from ABR queue 228 as at 233".

* * *

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

No new matter has been added by way of this amendment. All claim amendments have been made to correct informalities of language in old claims except to add new aspects as specifically noted herein.

By way of the present amendment, this application is believed to be in condition for allowance and such action in due course is earnestly solicited. The Examiner is invited to contact the undersigned by telephone to discuss this case further, if necessary.

Respectfully submitted,

14 August 2002
Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In re. Application of:	**GIROUX, Nathalie, et al.**
Serial No.:	**09/235,387**
Filed:	**01/22/1999**
Title:	**METHOD AND APPARATUS FOR PROVISIONING TRAFFIC DEDICATED CORES IN A CONNECTION-ORIENTED NETWORK**
Examiner:	**NGUYEN, Phuongchau BA**
Art Unit:	**2665**
Confirmation No.:	**4794**
Atty's Docket No.:	**53921/19**

IN THE SPECIFICATION:

The paragraph beginning on page 4 line 14, page 5 line 1 and page 5 line 21 respectively have been replaced with the following paragraphs:

In a first aspect, a method for transmitting non-real time traffic in a connection oriented communications network is provided. The network includes a network core which includes a core source and a core destination, the core source and the core destination having a path therebetween, the path having one of a plurality of classes of transmission service. The non-real time traffic is received at the core source from a plurality of connections and each of the connections have one of the plurality of classes of transmission service such that at least two of the connections do not respectively have a same class of transmission service. The method includes the step of, at the core source, aggregating the non-real time traffic received from the connections onto the path, the non-real time traffic being transmitted on the path without regard to which of the connections the non-real time traffic is associated and without regard to the class of transmission service of such connections. The method further includes the step of, at the core

destination, segregating the non-real time traffic so transmitted on the path according to which of the connections the non-real time traffic is associated. Flow control is applied between the core source and the core destination to thereby regulate the rate of transmission of the non-real time traffic along the path. The path is also provisioned with a guaranteed transmission bandwidth.

The connection oriented communications network may be an ATM network, the plurality of connections may be Virtual Channel Connections (VCCs), the path may be a non-real time Virtual Path Connection (VPC), the non-real time traffic may be ATM traffic and the classes of transmission service may be ATM service categories.

The flow control applied between the core source and the core destination may include a flow control algorithm whereby the rate of transmission of the non-real time traffic on the path is regulated by providing feedback information to the core source concerning congestion at a contention point on the path.

The flow control applied between the core source and the core destination may include a flow control algorithm whereby the rate of transmission of the non-real time traffic on the path is regulated by providing an explicit rate of transmission to the core source.

The non-real time Virtual Path Connection may operate according to an Available Bit Rate (ABR) service category.

At least one of the connections aggregated onto the path may be provisioned with a guaranteed bandwidth and the guaranteed transmission bandwidth of the path may be obtained by summing the guaranteed transmission bandwidths for the connections aggregated onto the path.

The guaranteed transmission bandwidth for the connections may be a guaranteed minimum transmission bandwidth and the guaranteed transmission bandwidth for the path may be a guaranteed minimum transmission bandwidth.

The transmission bandwidth in the network core may be allocated between real time traffic and non-real time traffic and a share of the transmission bandwidth in addition to the guaranteed minimum transmission bandwidth for the path may be made available to the path if the transmission bandwidth allocated to the real time traffic is unused.

A share of the transmission bandwidth in addition to the guaranteed minimum transmission bandwidth for one of the plurality of connections may be made available the connection if the transmission bandwidth allocated to another of the connections is unused.

The core source to core destination flow control applied between the core source and the core destination may be provided by a plurality of ABR flow control segments between the core source and the core destination.

The core source may further include a set of queues each corresponding to one of the classes of transmission service that are associated with the plurality of connections. The non-real time traffic received over the connections may be queued in the queue associated with the class of transmission service associated with each connection before aggregating the non-real time traffic onto the path.

The core source may further include a queue for each of the connections and the non-real time traffic received over the connections may be queued in the queue associated with the connection before aggregating the non-real time traffic onto the path.

Traffic management may be applied to the non-real time traffic at the core source.

The traffic management may include scheduling of the connections onto the path.

In a second aspect, a network entity for use in a connection oriented communications network is provided. The communications network includes a network core wherein traffic entering the network core is aggregated from connections onto paths within the network core. Traffic exiting the network core is segregated from the paths onto connections outside the network core. The traffic includes real time traffic and non-real time traffic. The real time traffic and the non-real time traffic are aggregated onto respective real time paths and non-real time paths. Each of the non-real time paths has a class of transmission service. Each of the connections carrying non-real time traffic has a class of transmission service such that at least two of the connections aggregated onto a non-real time path do not respectively have a same class of transmission service. Each of the non-real time paths is provisioned with a guaranteed transmission bandwidth. The real time traffic on each real time path is transmitted from a corresponding core source to a corresponding core destination according to a first class of transmission service and the non-real time traffic on each non-real time path is transmitted from a corresponding core source to a corresponding core destination according to a second class of transmission service. Flow control is applied between the core source and the core destination corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along the non-real time path. The network entity includes a first queue for storing real time traffic received at the network entity over at least one of the real time paths and a second queue for storing non-real time traffic received at the network entity over at least one of the non-real time paths. The network entity also includes a scheduling mechanism for servicing the first and second queues to thereby respectively generate non-real time traffic and real time traffic in an outgoing direction and a flow control mechanism for regulating the rate of

transmission of the non-real time traffic received at the network entity along each of the non-real time paths.

In a third aspect, a connection oriented communications network is provided. The communications network includes a network core, traffic entering the network core is aggregated from connections onto paths within the network core and traffic exiting the network core is segregated from the paths onto connections outside the network core. The traffic includes real time traffic and non-real time traffic. The non-real time traffic which enters the network core and is aggregated onto a path is received from connections that each have a class of transmission service such that at least two connections have classes of transmission service different from each other. The real time traffic and the non-real time traffic are each aggregated onto respective real time paths and non-real time paths. Each of the non-real time paths have one of the classes of transmission service and is provisioned with a guaranteed transmission bandwidth. The real time traffic on each real time path is transmitted from a corresponding core source to a corresponding core destination according to a first class of path transmission service and the non-real time traffic on each non-real time path is transmitted from a corresponding core source to a corresponding core destination according to a second class of path transmission service. Flow control is applied between the core source and the core destination corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along each non-real time path.

~~According to a first broad aspect of the present invention, there is provided a method for transmitting non-real time traffic in a connection oriented communications network, the network comprising a network core which includes a source and a destination, the source and the destination having a path therebetween, the non-real time traffic being received at the source~~

from a plurality of connections and each of the connections being associated with one of a plurality of classes of transmission service, the method comprising the steps of: (a) at the source, aggregating the non-real time traffic received from said connections onto the path, the non-real time traffic being transmitted on the path without regard to the connections with which the non-real time traffic is associated; (b) at the destination, segregating the non-real time traffic so transmitted on the path within the core according to the corresponding connections with which the non-real time traffic is associated; and wherein flow control is applied between the source and the destination to thereby regulate the rate of transmission of the non-real time traffic along the path.

According to a second broad aspect of the present invention, there is provided a network element for use in a connection oriented communications network, the communications network comprising a network core wherein traffic entering the network core is aggregated from a plurality of connections onto paths within the network core and wherein traffic exiting the network core is segregated from said paths onto connections outside the network core, the traffic comprising real time traffic and non-real time traffic, the real time traffic and the non-real time traffic each being aggregated onto respective real time paths and non-real time paths, the real time traffic on each real time path being transmitted from a corresponding source to a corresponding destination according to a first class of transmission service and the non-real time traffic on each non-real time path being transmitted from a corresponding source to a corresponding destination according to a second class of transmission service, and wherein flow control is applied between the source and the destination corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along said non-real

time path, the network element comprising: (a) a first queue for storing real time traffic received over at least one of said real time paths from an upstream direction; (b) a second queue for storing non-real time traffic received over at least one of said non-real time paths from an upstream direction; (c) a scheduling mechanism for servicing the first and second queues to thereby respectively generate non-real time traffic and real time traffic in a downstream direction; and (d) a flow-control mechanism for regulating the rate of transmission of said non-real time traffic from said upstream direction along each of said non-real time paths.

According to a third broad aspect of the present invention, there is provided a connection oriented communications network, the communications network comprising a network core wherein traffic entering the network core is aggregated from a plurality of connections onto paths within the network core and wherein traffic exiting the network core is segregated from said paths onto connections outside the network core, the traffic comprising real time traffic and non-real time traffic, the non-real time traffic which enters the network core being received from connections that are each associated with one of a plurality of classes of transmission service such that at least two connections are associated with different classes of transmission service, the real time traffic and the non-real time traffic each being aggregated onto respective real time paths and non-real time paths, the real time traffic on each real time path being transmitted from a corresponding source to a corresponding destination according to a first class of path transmission service and the non-real time traffic on each non-real time path being transmitted from a corresponding source to a corresponding destination according to a second class of path transmission service, and wherein flow control is applied between the source and the destination

~~corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along each said non-real time path.~~

The paragraph beginning on page 19, line 10 has been amended as follows:

A simplified network entity such as the network entity or element 220 of Figure 5 may be used in a network core in which the methods of this invention are implemented. The network entity may be a switch, router or other network device wherein a contention point for network traffic may occur. For example the network element could be used in an ABR VPC core network in which all per-VC traffic management is performed at edge nodes, such as the network core 2 of Figure 1 or the VPC network core 106 of Figure 2. Because VCC arbitration is performed at the edge in these networks, the core network entity 220 only needs to support two service categories, for instance a first service category for VPCs carrying real time traffic and a second service category for VPCs carrying non-real time traffic. Real time VPCs 222A and non-real time VPCs 224A are received at one or more input ports 223~~A~~ of the network entity 220. Real time VPCs 222B and non-real time VPCs 224B are egressed at one or more output ports 225 of the network entity 220. In the example according to Figure 5, the input ports 223 and output ports 225 are provided by way of a bidirectional link 227X. Other bidirectional links 227Y, 227Z comprising corresponding input and output ports like those of the bidirectional link 227X may be provided for the network entity 220.

The paragraph beginning on page 21, line 18 has been amended as follows:

Quality of Service for incoming traffic received at the input ports 223 over the non-real time VPCs 224A is ensured by a flow control mechanism 232 which may calculate the explicit

rate information for the ABR flow control. The bit rates for each of the incoming non-real time VPCs 224A are controlled according to the congestion state of the network entity 220 and the congestion state of other network elements in the ABR control loop associated with the VPC. For instance, the flow control mechanism 232 may receive available bandwidth information from the queue scheduler 230 as at 231 and may receive queue status information from ABR queue 228 as at 233 in order to assess the congestion state of the network element 220. The queue status information may include queue depth or queue growth rate or both, to name some examples. By controlling the bit rates in the individual non-real time VPCs 224A, the network entity 220 ensures that incoming traffic is not arriving at a rate which overwhelms the servicing capacity of the network entity 220. The feedback mechanism 232 also ensures that the amount of traffic aggregated on the non-real time VPCs 224A does not exceed the bandwidth available to the non-real time VPCs 224A. In addition, the feedback mechanism 232 may cause additional available bandwidth to be apportioned to the non-real time VPCs 224A if the bandwidth required by the real time VPCs ~~224A~~ 222A is reduced. Bandwidth allocation among the non-real time VPCs may be determined according to an explicit rate ABR algorithm. Because bandwidth is set aside in the network entity 220 for the PCRs of the real time VPCs 222A and because the bit rates of the non-real time VPCs 224A are controlled by the feedback mechanism 232, cell discard is not expected to be required in either the CBR queue 226 or the ABR queue 228. Where ABR flow control is adopted as the flow control mechanism of the network entity 220, resource management (RM) cells are employed to embody and transmit explicit rate information to the respective sources of the non-real time traffic by way of the outgoing non-real time VPCs 224B.

IN THE CLAIMS:

Claim 1 has been amended as follows:

1. A method for transmitting non-real time traffic in a connection oriented communications network, the network comprising a network core which includes a core source and a core destination, the core source and the core destination having a path therebetween, the path having one of a plurality of classes of transmission service, the non-real time traffic being received at the core source from a plurality of connections and each of the plurality of connections ~~being associated with~~ having one of ~~a~~ the plurality of classes of transmission service such that at least two of the plurality of connections do not respectively have a same class of transmission service, the method comprising the steps of:

(a) at the core source, aggregating the non-real time traffic received from said plurality of connections onto the path, the non-real time traffic being transmitted on the path without regard to which of the plurality of connections ~~with which~~ the non-real time traffic is associated and without regard to the class of transmission service of such plurality of connections;~~;~~

(b) at the core destination, segregating the non-real time traffic so transmitted on the path ~~within the core~~ according to which of the ~~corresponding~~ plurality of connections ~~with which~~ the non-real time traffic is associated; and

wherein flow control is applied between the core source and the core destination to thereby regulate the rate of transmission of the non-real time traffic along the path and wherein the path is provisioned with a guaranteed transmission bandwidth.

Claim 2 has been amended as follows:

2. The method of Claim 1, wherein the connection oriented communications network is an ATM network, the plurality of connections are Virtual Channel Connections (VCCs) ~~and~~, the path is a non-real time Virtual Path Connection (VPC), the non-real time traffic is ATM traffic and plurality of classes of transmission service are ATM service categories.

Claim 3 has been amended as follows:

3. The method of Claim 2, wherein the flow control applied between the core source and the core destination includes a flow control algorithm whereby the rate of transmission of the non-real time traffic on the path is regulated by providing feedback information to the core source concerning congestion at a contention point on the path.

Claim 4 has been amended as follows:

4. The method of Claim 2, wherein the flow control applied between the core source and the core destination includes a flow control algorithm whereby the rate of transmission of the non-real time traffic on the path is regulated by providing an explicit rate of transmission to the core source.

Claim 6 has been amended as follows:

6. The method of Claim 1, wherein ~~each~~ at least one of the plurality of connections aggregated onto the path is provisioned with a guaranteed bandwidth~~, and the non-real time traffic on the path is provisioned with a guaranteed bandwidth which~~ and the guaranteed transmission bandwidth of the path is obtained by summing the ~~corresponding~~ guaranteed

transmission bandwidths for ~~each~~ the at least one of the plurality of connections aggregated onto the path.

Claim 7 has been amended as follows:

7. The method of Claim 6, wherein the guaranteed ~~bandwidths corresponding to the connections and the path are guaranteed minimum bandwidths.~~ transmission bandwidth for the at least one of the plurality of connections is a guaranteed minimum transmission bandwidth and the guaranteed transmission bandwidth for the path is a guaranteed minimum transmission bandwidth.

Claim 8 has been amended as follows:

8. The method of Claim 7, wherein transmission bandwidth in the ~~core~~ network core is allocated between real time traffic and non-real time traffic, and wherein a share of the transmission bandwidth in addition to the guaranteed minimum transmission bandwidth for the path is made available to the path if the transmission bandwidth allocated to the real time traffic is unused.

Claim 9 has been amended as follows:

9. The method of Claim 7, wherein a share of the transmission bandwidth in addition to the guaranteed minimum transmission bandwidth for one of the plurality of connections is made available to ~~a corresponding connection if the guaranteed minimum bandwidth that is~~ the one of the plurality of connections if the transmission bandwidth allocated to another ~~connection~~ of the plurality of connections is unused.

Claim 10 has been amended as follows:

10. The method of Claim 5, wherein the core source to core destination flow control applied between the core source and the core destination is provided by a plurality of ABR flow control segments between the core source and the core destination.

Claim 11 has been amended as follows:

11. The method of Claim 10, wherein the core source further comprises a set of queues each corresponding to one of the plurality of classes of transmission service that are associated with the plurality of connections, and wherein the non-real time traffic received over ~~each connection~~ said each of the plurality of connections is queued in the queue associated with the class of transmission service associated with each connection before aggregating the non-real time traffic onto the path.

Claim 12 has been amended as follows:

12. The method of Claim 10, wherein the core source further comprises a queue for ~~each connection~~ said each of the plurality of connections and wherein the non-real time traffic received over ~~each connection~~ said each of the plurality of connections is queued in the queue associated with the connection before aggregating the non-real time traffic onto the path.

Claim 13 has been amended as follows:

13. The method of Claim 11, wherein traffic management is applied to the non-real time traffic at said core source.

Claim 14 has been amended as follows:

14. The method of Claim 13, wherein the traffic management comprises scheduling of the plurality of connections onto the path.

Claim 15 has been amended as follows:

15. A network entity for use in a connection oriented communications network, the communications network comprising a network core wherein traffic entering the network core is aggregated from a plurality of connections onto paths within the network core and wherein traffic exiting the network core is segregated from said paths onto connections outside the network core, the traffic comprising real time traffic and non-real time traffic, the real time traffic and the non-real time traffic each being aggregated onto respective real time paths and non-real time paths, each of the non-real time paths having one of a plurality of classes of transmission service, each of the plurality of connections carrying non-real time traffic having one of the plurality of classes of transmission service such that at least two of the plurality of connections aggregated onto a non-real time path do not respectively have a same class of transmission service, each of the non-real time paths is provisioned with a guaranteed transmission bandwidth, the real time traffic on each real time path being transmitted from a corresponding core source to a corresponding core destination according to a first class of transmission service and the non-real time traffic on each non-real time path being transmitted from a corresponding core source to a corresponding core destination according to a second class of transmission service, and wherein flow control is applied between the core source and the core

destination corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along said non-real time path, the network entity comprising:

(a) a first queue for storing real time traffic received at the network entity over at least one of said real time paths;

(b) a second queue for storing non-real time traffic received at the network entity over at least one of said non-real time paths;

(c) a scheduling mechanism for servicing the first and second queues to thereby respectively generate non-real time traffic and real time traffic in an outgoing direction; and

(d) a flow control mechanism for regulating the rate of transmission of said non-real time traffic received at the network entity along each of said non-real time paths.

Claim 17 has been amended as follows:

17. The network entity of Claim 16, wherein the flow control mechanism thereof provides an explicit rate of transmission to each of the corresponding core sources of the non-real time traffic received at the network element.

Claim 21 has been amended as follows:

21. The network entity of claim 17, wherein the connection oriented communications network is an ATM network, each of the real time paths is a real time Virtual Path Connection (VPC) ~~and each of the non-real time connections from which traffic on the real time~~, each of the plurality of connections from which non-real time traffic on the non-real time paths is aggregated is a non-real time ~~VPC.~~ Virtual Channel Connection (VCC), the non-real time traffic is ATM traffic and plurality of classes of transmission service are ATM service categories.

Claim 23 has been amended as follows:

23. The network entity of claim 22, wherein the flow control mechanism provides the explicit rate of transmission to the corresponding core source for the non-real time ~~VP source~~ traffic by way of information carried in Resource Management (RM) cells.

Claim 24 has been amended as follows:

24. The network entity of claim 23, wherein the network entity receives the real time traffic over a plurality of real time paths, wherein each real time path is associated with a Peak Cell Rate (PCR) and wherein the flow control mechanism determines the explicit rate of transmission for each of the non-real time paths by deriving an available bandwidth for the non-real time paths based on the PCRs of the real time ~~connections~~ paths and allocating a share of the available bandwidth to each of the non-real time paths.

Claim 25 has been amended as follows:

25. A connection oriented communications network, the communications network comprising a network core wherein traffic entering the network core is aggregated from a plurality of connections onto paths within the network core and wherein traffic exiting the network core is segregated from said paths onto connections outside the network core, the traffic comprising real time traffic and non-real time traffic, the non-real time traffic which enters the network core ~~being~~ and is aggregated onto a path is received from connections that ~~are~~ each ~~associated with~~ have one of a plurality of classes of transmission service such that at least two connections ~~are associated with different~~ have classes of transmission service different from each

other, the real time traffic and the non-real time traffic each being aggregated onto respective real time paths and non-real time paths, each of the non-real time paths having one of the plurality of classes of transmission service, each of the non-real time paths is provisioned with a guaranteed transmission bandwidth, the real time traffic on each real time path being transmitted from a corresponding core source to a corresponding core destination according to a first class of path transmission service and the non-real time traffic on each non-real time path being transmitted from a corresponding core source to a corresponding core destination according to a second class of path transmission service, and wherein flow control is applied between the core source and the core destination corresponding to each non-real time path to thereby regulate the rate of transmission of the non-real time traffic along each said non-real time path.